LLNL Environmental Restoration Division (ERD)
Standard Operating Procedure (SOP)

ERD SOP 2.8: Installation of Dedicated Sampling Devices—Revision: 5

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1.0 PURPOSE

The purpose of this SOP is to describe selection criteria and installation techniques for dedicated sampling pumps in ground water monitor wells to ensure installation is completed in a sound, consistent, and reliable manner.

2.0 APPLICABILITY

This SOP is applicable for use in the selection and installation of well purging and/or sampling devices. All personnel performing such tasks should review this procedure prior to commencement of related activities.

3.0 REFERENCES

3.1 Barcelona, M. J., J. A. Helfrich, E. E. Garske, and J. P. Gibb (1984), "A Laboratory Evaluation of Ground Water Sampling Mechanisms," *Ground Water Monitoring Review*, Spring, pp. 32-41.

3.2 Morse, S. I. (1997), San Francisco Bay Regional Water Quality Control Board, Toxics Cleanup Division; letter to Interested Parties. Subject: *Utilization of Non-Purge Approach*

for Sampling of Monitoring Wells Impacted by Petroleum Hydrocarbons, BTEX, and MTBE, File: 1123.64, January 31, 1997.

3.3 Nielsen, D. M. and G. L. Yeates (1985), "A Comparison of Sampling Mechanisms Available for Small Diameter Ground Water Monitoring Wells," *Ground Water Monitoring Review*, Spring, pp. 83-99.

3.4 Robbins, G. A., and J. M. Martin-Hayden (1991), Mass Balance Evaluation of Monitoring Well Purging: Part 1. Theoretical Models and Implications for Representative Sampling," *J. Contam. Hydrol.* 8, 203–224.

3.5 Schilling K. E. (1995), Low-Flow Purging Reduces Management of Contaminated Groundwater, *Environmental Protection*, December 1995.

3.6 U.S. EPA (1992), *RCRA Ground-Water Monitoring: Draft Technical Guidance*, Washington, D.C. (EPA/530-R-93-001).

3.7 U.S. Environmental Protection Agency (EPA) (1995), Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, *Ground Water Issue*, EPA/540/S-95/504.

3.8 U.S. Environmental Protection Agency (EPA) (1995), *Use of Low-Flow Methods for Ground Water Purging and Sampling: An Overview*, Quick Reference Advisory (December 1995).

4.0 DEFINITIONS

See SOP Glossary.

5.0 RESPONSIBILITIES

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Field Coordinator (FC)

The FC in consultation with the Drilling Geologist (DG), Subproject Leader (SL), and the Sampling Coordinator (SC) selects the appropriate monitor well pump. The FC is solely responsible for ordering and ensuring proper installation of the pump once it has been selected.

5.3 Subproject Leader (SL)

The SL is responsible for the overall investigation, planning, and assessment and remediation within a study or treatment facility area.

5.4 Field Support Personnel

The field support personnel are responsible for providing necessary equipment, collection devices, and general field support, which enables sampling personnel to perform field activities in a timely and efficient manner.

6.0 PROCEDURE

6.1 Choosing the Placement of the Appropriate Sampling Device

6.1.1 In order to ensure timely sampling of LLNL wells and prevent cross-contamination caused by moving pumps from well to well, wells are usually fitted with dedicated sampling pumps, unless otherwise specified by the SL.

6.1.2 The choice of pump type largely depends on the sampling methodology that best matches the Data Quality Objective (DQO), the type of constituents being sampled for, and specifications such as well depth and yield. Completed wells are initially sampled (baseline sampling) by high volume purge techniques when possible. Hydrogeologic data is used in conjunction with DQOS to decide the sampling device type and depth of sampling device intake. Pumps are generally installed at the bottom of the screened interval in monitor wells at Site 300 due to the large number of low-yielding wells. Pumps at the Livermore Site are installed at mid-screened interval, at the discretion of the SL and/or FC. As appropriate, the SL, SC, or FC determines the type and placement of all dedicated pumps.

6.2 Preparation

6.2.1 Perform preparation activities per SOP 4.1, "General Instructions for Field Personnel."

6.2.2 Identify wells requiring installation of dedicated sampling device.

6.2.3 Review any available chemical analyses. The Site Safety Officer should be consulted as to the appropriate safety precautions and/or protective gear required.

6.2.4 The SC in consultation with the SL, should review the available chemical analyses, drilling logs, well development, and hydraulic testing records to determine the appropriate pump type and placement for each monitor well.

6.2.5 Order any necessary equipment (i.e., pumps, discharge tubing, control boxes, sounding tubes, sanitary seals, etc.).

6.2.6 Procure the appropriate pieces of equipment according to Attachment A, Equipment Checklist.

6.2.7 Ensure that the pump installation truck containing a winch and an operational power supply is available.

6.2.8 Ensure that all equipment and materials to be installed in the well have been adequately decontaminated as described in SOP 4.5, "General Equipment Decontamination."

6.2.9 Locate monitor wells that require dedicated pumps.

6.3 Operation

6.3.1 Bladder Pumps

A. Measure the appropriate lengths of discharge line, gas line, sounding tube (when necessary), so the pump intake will be at the specified depth. Ensure that the safety cable is slightly shorter than the gas line and discharge line so it will support the pump when installed.

B. Fasten the tubing to the pump and the top cap using threaded compression fittings, as specified by the pump manufacturer.

C. Feed the tubing through the appropriate port in the sanitary seal (when necessary).

D. Lower the complete assembly down the well by hand.

E. Install wellhead seal of appropriate size for below-grade wellheads.

F. Secure the cap assembly on top of the well casing. Place a cap on the sounding port (when necessary). Attachment B is a diagram of a well with a dedicated bladder pump.

6.3.2 Electric Submersible Pumps

A. Center the pump hoist over the well.

B. Splice the pump wiring harness to the electrical cable using watertight solderless connectors.

C. Secure safety cable to pump.

D. Thread a hoisting plug into the discharge line and hoist it to a vertical position.

E. Connect torque-arrestor at the bottom of the discharge pipe, and adjust so that it fits snugly into the well casing.

F. Thread the first 20-ft section of discharge line into the pump.

G. Using a plastic clamp (i.e., tie-wrap), bundle the discharge line, electrical cable, safety cable, and sounding tube at 5- to 10-ft intervals.

H. Carefully lower the assembly into the well using the pump hoist.

I. After lowering the assembly to the first pipe coupling, place a holding device under the coupling and lower onto device. Add additional lengths of discharge pipe and sounding tube while repeating steps F-H until the pump intake reaches the next coupling, and repeat to the last section of pipe.

J. Place the sanitary seal on the final piece of discharge pipe (precut to the appropriate length), thread the final pipe onto the discharge line, and connect the safety cable to the seal.

K. Field support personnel will splice about 4 ft of 12-gauge, four-strand, sheathed electrical cord to the end of the 10-gauge electrical cable using solderless connectors. Feed the cord through the appropriate port and fitting on the sanitary seal.

L. Connect the power cord in the following way:

1. Finish the cord with a 115- or 230-volt AC plug (male end) as specified by the pump manufacturer. Attachment C is a diagram of a below-grade wellhead completion.

M. Place threaded plugs in the discharge line and sounding tube. Attachment D is a diagram of a well with a dedicated electric submersible pump.

6.3.3 Specific-Depth Grab Sampling Devices (e.g., EasyPump)

A. A device, such as the EasyPump (see SOP 2.1, Attachment F) will have a power supply/safety cable cut to the correct length for the well and wound on a spool with power-supply plug fittings. A 12-volt submersible pump is attached to the power cord by means of these fittings. Due to the compact size of this sampling device, the spool, power cord, and pump may be left secured in the stovepipe, or removed and stored remotely for future use. The power supply/controller is hand carried to the site.

1. To install, attach disposable sample capture portion to the base of 12v pump. Hand lower to desired depth. The sample capture portion is disposable, and upon completion of the sampling event, may be discarded.

6.4 Post Operation

6.4.1 Perform post operation activities described in SOP 4.1, as applicable.

6.4.2 Use the Well Specification Form to record the date of installation, the pump type, and actual pump intake depth as recorded in the Well Entry Logbook and Pump Installation Logbook. The point-of-measurement (POM) for the pump intake depth should always be measured from the top of the concrete pad and recorded as such. Test the pump to make sure it is operational.

6.4.3 Secure the protective casing with its lock.

6.4.4 Transfer a copy of all recorded information to the SC and the Data Management Team (DMT).

7.0 QA RECORDS

7.1 Well Entry Logbooks

7.2 Pump Installation Logbook

7.3 Well Specifications Form

8.0 ATTACHMENTS

Attachment A—Equipment Checklist

Attachment B—Well Completion and Pump Placement for Bladder Pumps

Attachment C—Below Grade Wellhead Completions

Attachment D—Wellhead Completion and Pump Placement for Electrical Submersible Pumps

Attachment A

Equipment Checklist

Equipment Checklist

_____ Appropriate wellhead sanitary seals matched to well diameter

_____ Bladder pumps, electric submersible pumps, specific-depth grab sampling devices and bailer

_____ Deep well wire water tight connectors (electrical sub.)

_____ Electrical cable (10- and 12-gauge, 4-wire), power plugs for electric submersible pumps, cable connectors (water tight)

_____ Fittings and valves for sampling tee's

_____ Schedule 80 polyvinyl chloride (PVC) pipe (1 to 2 in. depending on pump size) for discharge tubes on electric submersible pumps, sch. 80 pipe couplers (threaded)

_____ Schedule 120-40 PVC pipe (1 in.) to be used as sounding tubes for water level measurements

_____ Slip to slip well casing couplers

_____ Slip to thread couplers for sounding tubes

_____ Stainless steel safety cable (1/8 in.) to span the distance from pump to top of the well casing

_____ Discharge tubes for bladder pumps and Quick-connect fittings for tubing

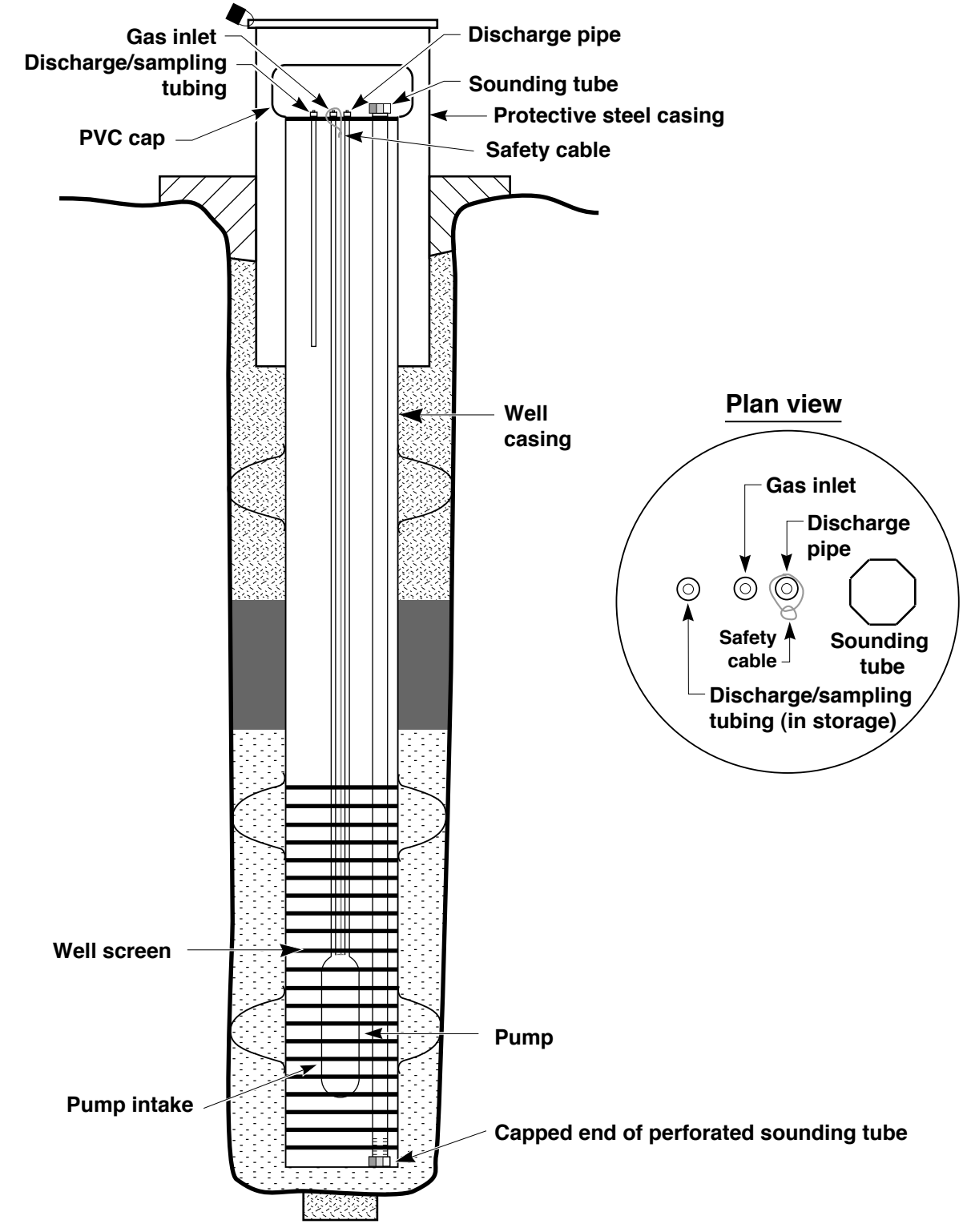
_____ Threaded plugs for discharge and sounding pipes (electrical sub.)

_____ Tool kit

_____ Torque arrestor

Attachment B

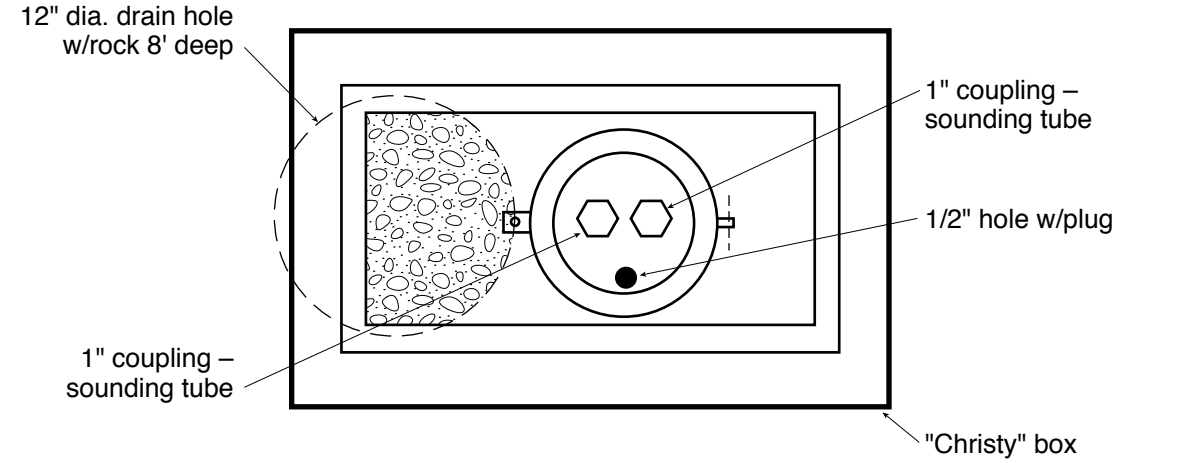
Well Completion and Pump Placement for Bladder Pumps

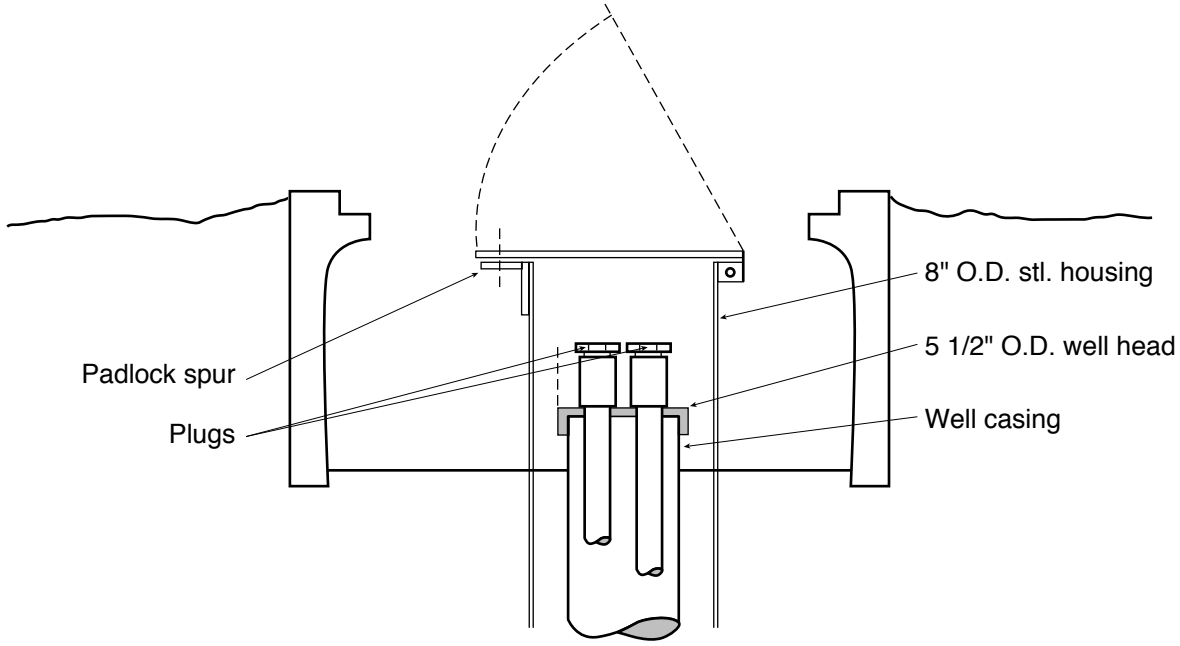


Attachment B. Wellhead completion and pump placement for bladder pumps.

Attachment C

Below Grade Wellhead Completions





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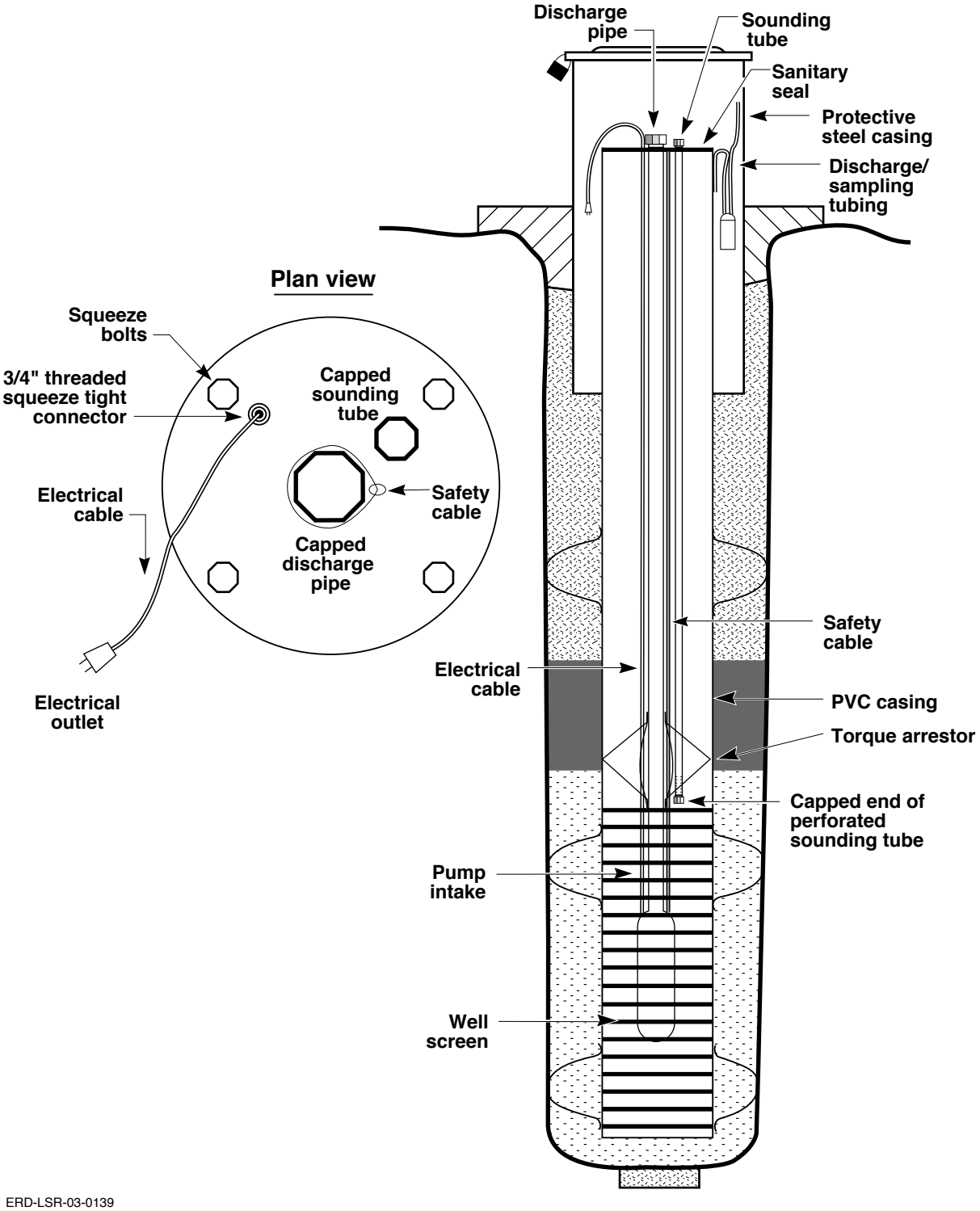
Attachment C. Below grade wellhead completions.

Attachment D

Wellhead Completion and Pump Placement for Electric Submersible Pumps



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Attachment D. Wellhead completion (at the Livermore Site) and pump placement for electric submersible pumps.